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Abundance and Run Timing of Adult Pacific Salmon in the Tuluksak River, Yukon Delta National Wildlife Refuge, Alaska, 2004

Alaska Fisheries Data Series Number 2005–6

Kenai Fish and Wildlife Field Office
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Laura M. Zabkar, Frank Harris, and Ken C. Harper

Abstract

A resistance board weir was used to collect abundance, run timing, and biological data from salmon returning to the Tuluksak River, a tributary to the lower Kuskokwim River, between June 22 and September 10, 2004. Data collected were used in-season to manage the commercial and subsistence fisheries in the Kuskokwim area. A total of 11,796 chum *Oncorhynchus keta*, 1,475 Chinook *O. tshawytscha*, 136 sockeye *O. nerka*, 496 pink *O. gorbuscha* and 20,336 coho salmon *O. kisutch* were counted through the weir during 2004. Peak weekly passage occurred July 4 to 10 for Chinook and sockeye salmon, July 18 to 24 for chum and pink salmon, and August 15 to 21 for coho salmon.

Introduction

The Tuluksak River, located approximately 222 river kilometers (rkm) upstream from the mouth of the Kuskokwim River, Alaska, (Whitmore et al. 2004) flows through the Yukon Delta National Wildlife Refuge (Refuge) and supports spawning populations of chum, Chinook, pink, coho, and a small population of sockeye salmon. These salmon contribute to large subsistence and commercial fisheries in the lower Kuskokwim River drainage. In addition to human consumption, salmon provide food for brown bears and other carnivores, raptors and scavengers. These salmon also sustain resident fish species and salmon fry that rely heavily on the nutrient base provided by salmon carcasses (U.S. Fish and Wildlife Service 1992).

Under guidelines established in the sustainable salmon fisheries policy 5AAC.39.222, the Alaska Board of Fisheries designated Kuskokwim River chum and Chinook salmon as yield concerns. This designation was based upon the continued inability, despite specific management measures, to maintain expected yields, or have stable surplus above the stock's escapement needs for three of the past five years. Based upon this designation, the salmon fishery in the Kuskokwim River drainage has been managed under the Kuskokwim River Salmon Rebuilding Management Plan for the past four years (Rebuilding Plan) (5AAC 07.365; Ward et al. 2003; Bergstrom and Whitmore 2004). The portion of the Kuskokwim River within the boundaries of the Refuge was under both the Rebuilding Plan and the Federal Subsistence Fishery Management program.

The Alaska Department of Fish and Game (Department), the U.S. Fish and Wildlife Service (Service), and the Kuskokwim River Salmon Management Working Group (Working Group) work together to achieve the goals of both The Rebuilding Plan and the Federal Subsistence Fishery Management program. The Rebuilding Plan was established to provide management guidelines resulting in the sustained yield of salmon stocks large enough to meet the following goals: (1) To manage for the achievement of established escapement goals; (2) To meet the amounts necessary for subsistence; and (3) To allow for a commercial fishery on harvestable surplus after escapement and subsistence needs are projected to be met (Ward et al. 2003). In

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addition to the goals set by the Department, the Service, and the Working Group, the Alaska National Interest Lands Conservation Act (ANILCA) mandates that salmon populations and their habitats be conserved in their natural diversity within the Refuge.

To manage for sustained yields and conservation of individual salmon stocks, managers need escapement data and migratory timing of individual stocks accompanied by sex and age composition throughout the migratory period. Managing for individual salmon stocks can be difficult since salmon stocks are mixed during the annual migration up the Kuskokwim River, increasing the potential for smaller salmon stocks to be over harvested during periods of commercial and subsistence fishing. Therefore, state and federal managers attempt to conserve these smaller salmon stocks by distributing harvest throughout the entire salmon run.

In previous years, salmon escapements were monitored using aerial index surveys and a resistance board weir in the Tuluksak River. Aerial index surveys started in 1965 and occurred sporadically until 1997 (Harper 1997; Ward et al. 2003). These surveys however, were infrequently used for in-season management of the Kuskokwim River fisheries because the surveys often occurred after the commercial and subsistence fishing seasons.

In order to obtain salmon escapement data, a resistance board weir was used in the Tuluksak River between 1991 and 1994, and between 2001 and 2004. A weir was not operated on the Tuluksak River between 1995 and 2000.

In 2004, the Tuluksak River escapement monitoring project transitioned from a cooperative agreement to a contract between the Service and the Village of Tuluksak. This contract has continued to meet the goals of the Service, Department, Working Group and the mandates of ANILCA. No change has been implemented to the following project objectives: (1) count the daily passage of chum, Chinook, sockeye, pink, and coho salmon and resident fish species through a weir on the Tuluksak River; (2) describe run-timing using daily passage counts of chum, Chinook, sockeye, pink, and coho salmon passing through the weir; (3) estimate weekly age and sex composition of chum, Chinook, sockeye, and coho salmon passing through the weir; (4) determine the length of chum, Chinook, sockeye, and coho salmon by age and sex; (5) enumerate chum, Chinook, sockeye, pink, and coho salmon carcasses washing onto the weir each day. These data will aid the in-season management of the Kuskokwim River subsistence and commercial fisheries; and setting biological escapement goals to maintain the sustainability of salmon resources.

Study Area

The Tuluksak River is one of several tributaries flowing into the lower Kuskokwim River and is located approximately 116 rkm northeast of Bethel, AK (Whitmore et al. 2004). The Tuluksak River is approximately 137 rkm in length and its watershed encompasses approximately 2,098 km^2 (Harper 1997) (Figure 1). It originates in the Kilbuck Mountains and flows to the northwest. The Fog River drains into the lower portion of the Tuluksak River and is the only major tributary. The Tuluksak River is a slow moving river for the majority of its length and is characterized by dense overhanging vegetation and cut banks. The lower portion of the river is characterized by low-gradient, silty substrate and turbid waters.

The river section at the weir site, approximately 49 rkm from the mouth, is 42 meters wide, shallowest in mid-river and deepest near the banks. The substrate contains primarily sand mixed with fine gravel. Water clarity is moderately clear but can become turbid during rainy periods and when boat traffic is present.

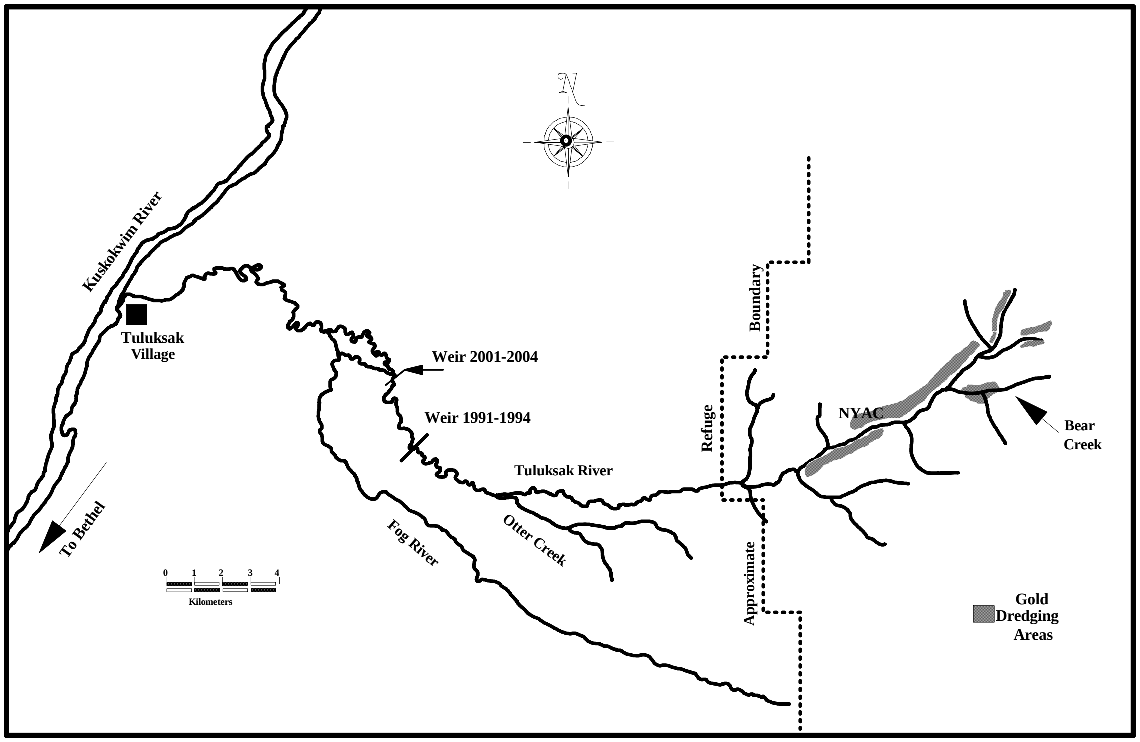

FIGURE 1.—Tuluksak River weir location, Yukon Delta National Wildlife Refuge, Alaska, 1991-1994, and 2001-2004.

Methods

Weir Operations

A resistance board weir (Tobin 1994) was installed in 2004 in the Tuluksak River at rkm 49 (61°02.641') (W160°35.049'). This location is approximately 16 rkm downstream from the previous weir site used between 1991 and 1994 (Harper 1995 a,b,c; 1997). The weir was relocated to a position below known salmon spawning grounds. The lower site also provides easier boat access to the weir during low water conditions.

This weir was modified slightly from the previous weir design used between 1991 and 1994 (Tobin 1994). A range of modifications took place in 2001 to increase efficiency of installation, operations, and takeout, and increase the efficiency of fish passage (Gates and Harper 2003).

Two passage panels were installed with attached live traps. Counts started at approximately 0700 hours every day and continued until visibility was too poor to identify salmon by species. All passing salmon and resident fish were identified to species and recorded.

A stream gauge was installed near the shore on the river right bank approximately 10 meters downstream of the weir. The stream gauge (cm), was read twice daily and noted in the field log. To compensate for the placement of the stream gauge and to have it more accurately reflect the water depth across the river, an average water depth and stream gauge reading were taken simultaneously post installation. Water temperatures were recorded using an ONSET, Optic StowAway ®Temp logger. The temperature logger was programmed to record a temperature reading every 30 minutes and was placed in a location not affected by daily fluctuations of surface temperatures. The Temp logger was downloaded once at the end of the season. Temperature data were then averaged for each day.

Biological Data

Statistical weeks started on a Sunday and continued through the following Saturday (Harper 1997). Target sample size consisted of 210 chum and Chinook salmon each week. The coho salmon sample was obtained at three different time periods during the run and consisted of 70 fish per sample. Sockeye salmon were sampled on an opportunistic basis. Biological sampling occurred between Monday and Thursday of each statistical week in order to obtain a snapshot sample (Geiger et al. 1990). Once the quota was met for a particular species, sampling would stop for that species and continue for others but typically would not extend past Thursday.

Age, sex, and length data were collected from each sampled salmon. Sampled fish were caught using the live trap attached to each passage chute. A fyke gate, installed on the entrance of each trap, allowed fish to enter and at the same time minimized the number of fish exiting the trap downstream. Sampling occurred when approximately 40 fish were in the trap. Four scales were extracted from Chinook and coho salmon and one was extracted from chum and sockeye salmon for age determination. All scales were taken from the preferred area using methods described by Koo (1962) and Mosher (1968). Sex was determined by observing external characteristics, and length was measured to the nearest 5 millimeters from the mid-eye to the fork of the caudal fin. All data was recorded and then transferred to mark-sense forms at the end of each sample day. Mark-sense forms were processed by the Department when the aging and impression process was completed.

Ages for salmon were reported according to the European Method (Koo 1962) where numerals preceding the decimal denote freshwater annuli and numerals following the decimal denote marine annuli. Total years of life at maturity is determined by adding one year to the sum of the two digits on either side of the decimal (i.e. age 1.4 and 2.3 (1.4=1+4+1=6 and 2.3=2+3+1=6) are both six-year-old fish from the same parent year). The parent year is determined by subtracting fish age from the current year.

Characteristics of fish passing through the weir were estimated using standard stratified random sampling estimators (Cochran 1977). Within a given stratum m, the proportion of species i passing the weir that are of sex j and age k (p_{ijkm}) was estimated as

$$\hat{p}_{ijkm} = \frac{n_{ijkm}}{n_{i++m}},$$

where n_{ijkm} denotes the number of fish of species i, sex j, and age k sampled during stratum m and a subscript of "+" represents summation over all possible values of the corresponding variable, e.g., n_{i++m} denotes the total number of fish of species i sampled in stratum m. The variance of $\hat{p}_{ijkm}$ was estimated as

$$\hat{v}\left(\hat{p}_{ijkm}\right) = \left(1 - \frac{n_{i++m}}{N_{i++m}}\right) \frac{\hat{p}_{ijkm}\left(1 - \hat{p}_{ijkm}\right)}{n_{i++m} - 1},$$

where N_{i++m} denotes the total number of species i fish passing the weir in stratum m. The estimated number of fish of species i, sex j, age k passing the weir in stratum m (N_{ijkm}) is

$$\hat{N}_{ijkm} = N_{i++m}\,\hat{p}_{ijkm},$$

with estimated variance

$$\hat{v}\left(\hat{N}_{ijkm}\right) = N_{i++m}^{2}\,\hat{v}\left(\hat{p}_{ijkm}\right).$$

Estimates of proportions for the entire period of weir operation were computed as weighted sums of the stratum estimates, i.e.,

$$\hat{p}_{ijk} = \sum_{m} \left(\frac{N_{i++m}}{N_{i+++}}\right) \hat{p}_{ijkm}$$

with estimated variance

$$\hat{v}\left(\hat{p}_{ijk}\right) = \sum_{m} \left(\frac{N_{i++m}}{N_{i+++}}\right)^{2} \hat{v}\left(\hat{p}_{ijkm}\right).$$

The total number of fish in a species, sex, and age category passing the weir during the entire period of operation was estimated as

$$\hat{N}_{ijk} = \sum_{m} \hat{N}_{ijkm},$$

with estimated variance

$$\hat{v}\left(\hat{N}_{ijk}\right) = \sum_{m} \hat{v}\left(\hat{N}_{ijkm}\right).$$

If the length of the r^{th} fish of species i, sex j, and age k sampled in stratum m is denoted x_{ijkmr}, the mean length of all such fish (μ_{ijkm}) was estimated as

$$\hat{\mu}_{ijkm} = \left(\frac{1}{n_{ijkm}}\right)\sum_{r} x_{ijkmr},$$

with corresponding variance estimator

$$\hat{v}\left(\hat{\mu}_{ijkm}\right) = \left(1 - \frac{n_{ijkm}}{\hat{N}_{ijkm}}\right) \frac{\sum_r \left(x_{ijkmr} - \hat{\mu}_{ijkm}\right)^2}{n_{ijkm}\left(n_{ijkm} - 1\right)}$$

The mean length of all fish of species i, sex j, and age k (μ_{ijk}) was estimated as a weighted sum of the stratum means, i.e.,

$$\hat{\mu}_{ijk} = \sum_m \left(\frac{\hat{N}_{ijkm}}{\hat{N}_{ijk}}\right) \hat{\mu}_{ijkm}$$

An approximate estimator of the variance of $\hat{\mu}_{ijk}$ was obtained using the delta method (Seber 1982),

$$\hat{v}\left(\hat{\mu}_{ijk}\right) = \sum_m \left\{ \hat{v}\left(\hat{N}_{ijkm}\right) \left[\frac{\hat{\mu}_{ijkm}}{\sum_x \hat{N}_{ijkx}} - \sum_y \frac{\hat{N}_{ijky}\,\hat{\mu}_{ijky}}{\left(\sum_x \hat{N}_{ijkx}\right)^2} \right]^2 + \left(\frac{\hat{N}_{ijkm}}{\sum_x \hat{N}_{ijkx}} \right)^2 \hat{v}\left(\hat{\mu}_{ijkm}\right) \right\}$$

A chi-square test of independence (Agresti 1990) was used to test the hypothesis of independence of sex and age, by species. Because a fundamental assumption of the test is that the data are derived from a single random sample, the test was modified to accommodate a stratified random sampling design. Using the first order approximation of Rao and Thomas (1989), the usual test statistic was divided by the mean generalized design effect. A significance level of $\alpha = 0.05$ was used.

A two-sample t-test $\alpha = 0.05$ (Systat 8.0) was used to test the hypothesis that male and female fish of age k have equal mean lengths. Data were pooled across all strata and treated as one sample to compare lengths.

Results

Weir Operations

The weir was installed on June 21, 2004, and operated through September 10, 2004. During installation, the rail was reset to compensate for substrate change that occurred over winter and spring break-up. The weir was installed in the same location as 2003. No damage occurred to the weir components during the 2004 field season.

Average water depth during 2004 was 44 cm. Maximum water depth of 68 cm occurred on June 19 and a minimum depth of 36 cm occurred on July 26 (Appendix 1). Water temperatures averaged 14°C, and ranged from 10°C on June 24 to 17°C on July 12 (Appendix 1).

Biological Data

Chum Salmon—A total of 11,796 chum salmon, passed through the weir from June 23 to September 10. Sixty-nine of the chum salmon passing the weir, (<1%) were observed with gill net marks. Peak weekly passage (N=3,292), representing 28% of the escapement, occurred between July 18 and July 24 (Figure 2). The observed median cumulative passage date occurred on July 18 (Appendix 2).

Five age groups were identified from 1,187 chum salmon sampled from the weir escapement. Males comprised 57% of the chum salmon escapement (Figure 3; Appendix 3). Age 0.4 chum salmon were the most abundant, accounting for 46% of the aged sample (Appendix 3). There was a significant difference in age composition between sexes (P<0.001).

Lengths of age 0.3 and 0.4 chum salmon ranged from 450 to 770 mm (Appendix 4). In sampled fish, the mean length of males was greater than that of same-aged females for fish ages 0.2, 0.3, and 0.4 (two-tailed t test: age 0.2, t=7.2, df=234, P=0.000; age 0.3, t=9.1, df=398, P=0.000; age 0.4, t=11.2, df=544, P=0.000). Insufficient data was available for comparison of ages 0.5 and 0.6. Age 0.6 in the 2004 sample was only represented by one fish.

Chum salmon carcasses were first recorded on June 24, 2004. Median cumulative passage dates for escaping chum salmon and chum salmon carcasses washing onto the weir were separated by 10 days (Figure 4). A total of 2,175 chum salmon carcasses passed downstream over the weir from June 24 to September 10.

Chinook Salmon—Chinook salmon (N=1,475) passed through the weir between June 26 and August 21. Twenty-five of the Chinook salmon passing the weir, (2%) were observed with gill net marks. Peak weekly passage occurred between July 4 and July 10 (N=497) (Figure 2). The median cumulative passage date occurred on July 10 (Appendix 2).

Five age groups were identified from 255 Chinook salmon sampled between June 28 and August 10, 2004 (Appendix 5). Females composed an estimated 37% of the total Chinook salmon escapement (Figure 3; Appendix 5). Age 1.3 and 1.4 dominated the Chinook salmon escapement by 41% and 33%, and age 1.2 accounted for 25% (Appendix 5). Age 1.1 was present in the 2004 sample. Age composition differed between sexes ($X^2(\delta.)$=136.7, df=4, P<0.001). Males were primarily age 1.3 (53%), and females were predominantly age 1.4 (73%) (Appendix 5).

Lengths at age for 1.3 and 1.4 Chinook salmon ranged from 555 to 1,100 mm (Appendix 6). Mean lengths of age 1.2 males and females did not differ (two-tailed t test: age 1.2, t=0.046, df=63, P=0.964). In sampled fish, the mean length of age 1.3 and age 1.4 females was greater than that of same-aged males (two-tailed t test: age 1.3, t=4.5, df=107, P=0.000; age 1.4, t=3.0, df=74, P=0.004) (Appendix 6). Insufficient samples were available for comparison of ages 1.1 and 1.5.

Chinook salmon carcasses (N=154) were observed on the weir starting July 5, 2004. This was approximately 9 days after the first Chinook salmon was counted through the weir. The median cumulative passage dates for daily escapement and carcasses (August 4) were separated by 25 days (Figure 4).

Sockeye Salmon—Sockeye salmon (N=136) passed the weir between July 4 and September 7, 2004. Peak weekly passage occurred between July 4 and 10 (N=50) (Figure 2), with a median cumulative passage date of July 15 (Appendix 2).

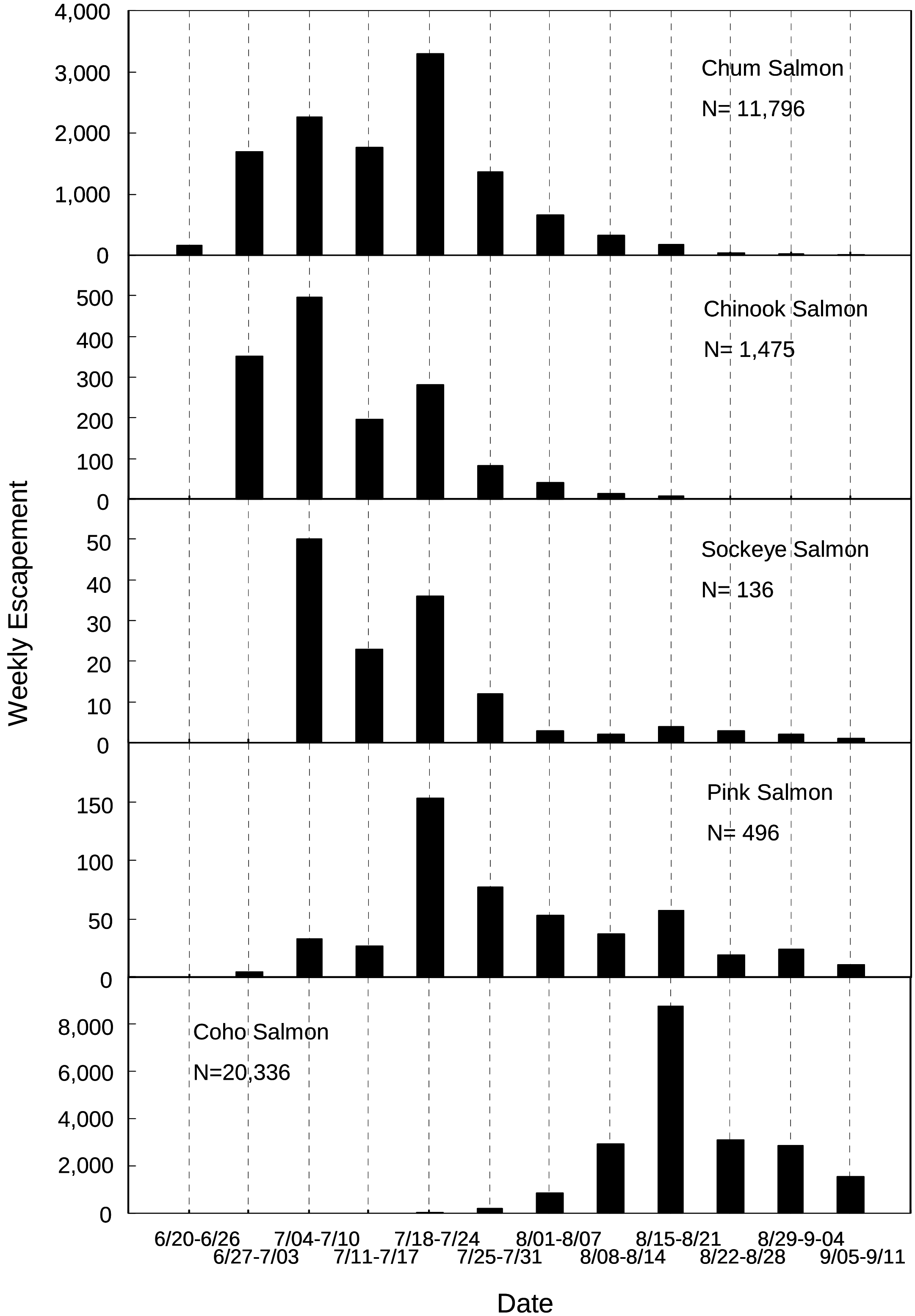

FIGURE 2.—Weekly chum, Chinook, sockeye, pink, and coho salmon escapements through the Tuluksak River weir, Alaska, 2004.

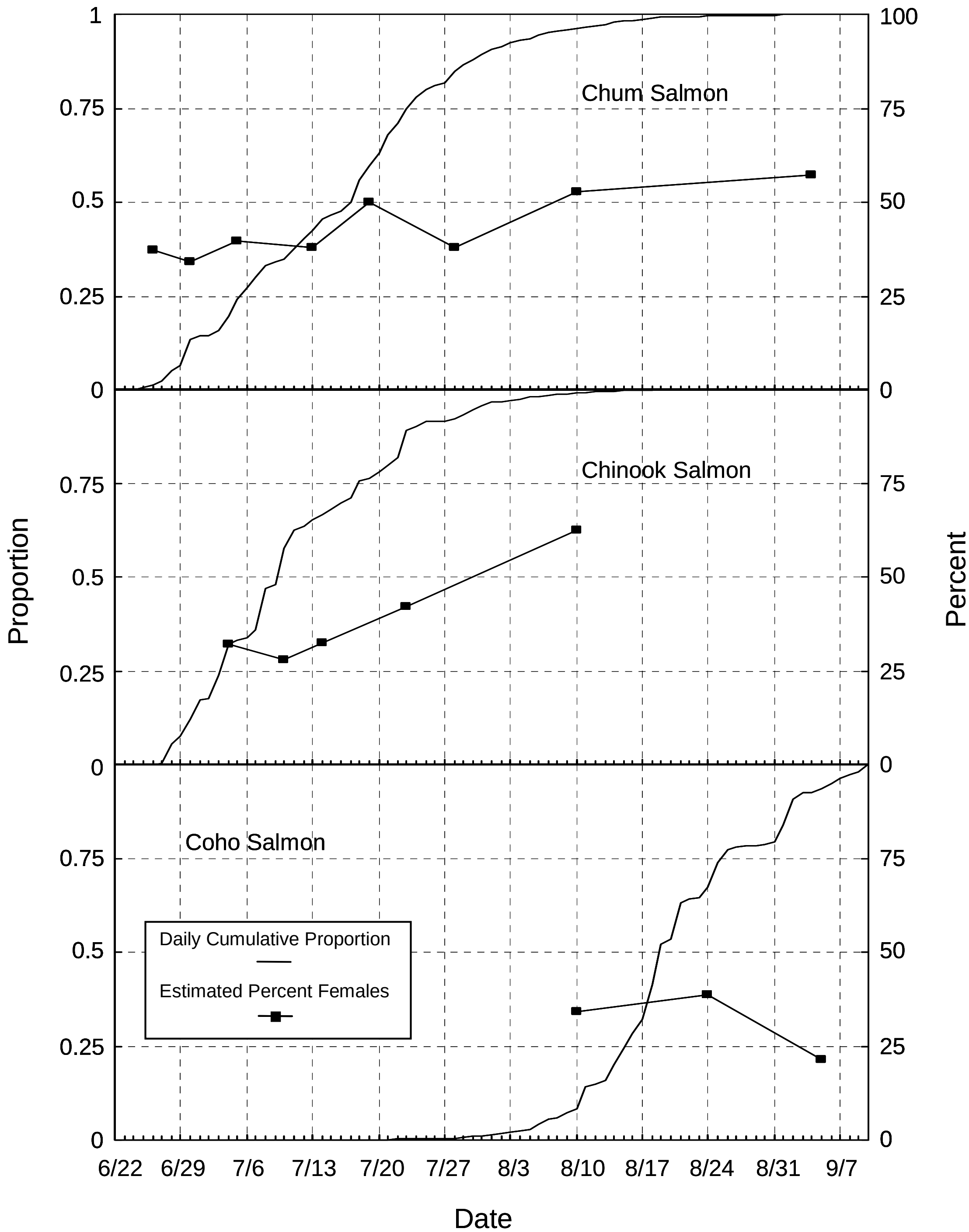

FIGURE 3.—Cumulative proportion and percent females of chum, Chinook, and coho salmon through the Tuluksak River weir, Alaska, 2004.

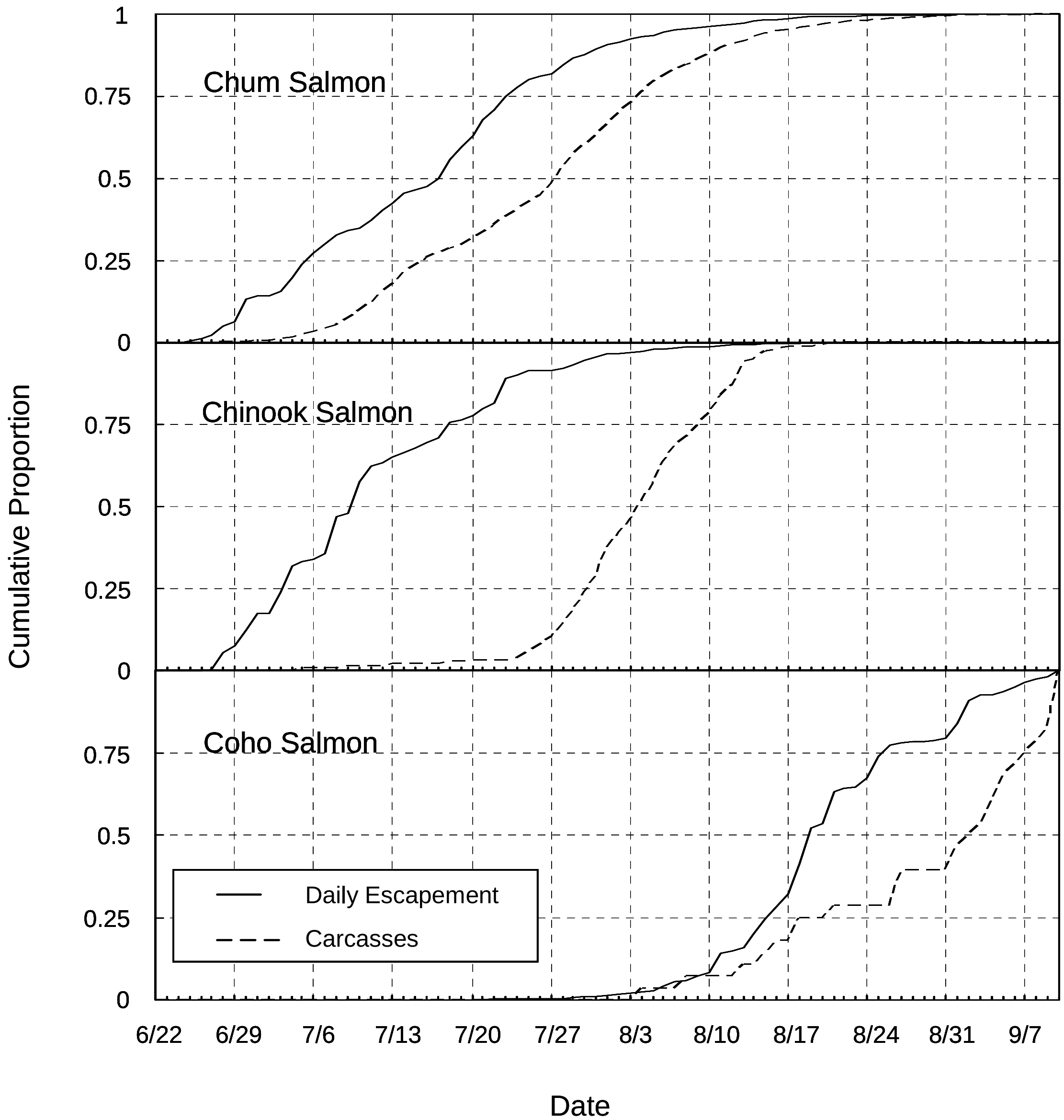

FIGURE 4.—Cumulative proportion of daily chum, Chinook, and coho salmon passage and carcasses washing onto the upstream side of the Tuluksak River weir, Alaska, 2004.

Nineteen sockeye salmon carcasses were counted on the upstream side of the weir during 2004. The first carcass washed onto the weir on July 8, four days after the first sockeye salmon was counted through the weir.

Pink Salmon—Pink salmon (N=496) started to pass the weir on June 28 and periodically passed in small numbers until September 9, 2004. Peak weekly passage was observed between July 18 and 24 (N=153) (Figure 2). The median cumulative passage date was July 28 (Appendix 2).

The first pink salmon carcass washed onto the weir on July 17, nineteen days after the first pink salmon was counted through the weir. The median cumulative passage date for pink salmon carcasses was August 7. One hundred and eighty-four pink salmon carcasses were counted on the weir during operations, which accounted for 37% of the pink salmon counted through the weir. The median cumulative passage dates for daily escapement and carcasses were separated by 10 days.

Coho Salmon—Coho salmon (N=20,336) passed through the weir between July 14 and September 10. Gillnet marks (N=966) were observed on 2% of the coho salmon passing the weir. Peak weekly passage (N=8,759) was between August 15 and August 21 (Figure 2). The median cumulative passage date occurred on August 19 (N=2,142) (Appendix 2).

Three age classes were identified from 184 sampled coho salmon. The majority (96%) of the coho salmon were age 2.1 (Appendix 7). The remaining sample was comprised of age 3.1 (3%) and 1.1 (1%) fish. Females composed 32% of the coho salmon escapement (Figure 3; Appendix 7). Age composition did not differ between sexes for age 2.1 ($P>0.05$). Mean lengths were not significantly different ($P>0.05$) for age 2.1 (546 mm) males and (547 mm) females (Appendix 8). Insufficient age and length composition data were available for age 1.1 and 3.1 (Appendix 8).

Coho salmon carcasses were first recorded on August 4, 2004. Median cumulative passage dates for escaping coho salmon and coho salmon carcasses washing onto the weir were separated by 14 days (Figure 4). By September 11, 2004, when the weir was removed, 28 coho salmon carcasses were passed over the weir.

Resident Species—Resident species counted through the weir consisted of ten Dolly Varden, 16 whitefish, one northern pike, and 28 Arctic grayling. Although smaller sized resident species were able to pass freely through the pickets, passage through the passage chutes was recorded throughout the entire season. A total of one Dolly Varden, eight whitefish, two northern pike, and one Arctic grayling carcass were recorded on the weir.

Discussion

Weir Operations

The weir was operated from June 22 through September 10, 2004. Installation was facilitated by low water depths during early June. Low water depths were consistent throughout the entire weir operational period. Due to the lack of rainfall, a record low average water depth (44 cm) occurred, which was 7 cm below the previous low water average of 51 cm in 2002.

The weir was removed on September 11, 2004 and the substrate rail and cable were left in place to expedite installation in 2005. Sand bags were also placed on the rail and cable to minimize scouring during winter and spring.

Biological Data

Chum Salmon—The estimated chum salmon escapement in 2004 (N=11,796) was within the historic range of 7,675 to 19,321 fish, and slightly above the historical average (N=11,678) (Figure 5). The 2004 escapement was 61% of the 2001 chum salmon escapement (N=19,321), which is the highest escapement on record (Gates and Harper 2002).

Other escapement projects located on Kuskokwim River tributaries indicate the 2004 chum salmon escapement was average to above average. The sonar project on the Aniak River, achieved the sustainable escapement goal for the third year in a row and the sonar count was the highest on record since 1981 (Whitmore et al. 2004). Kwethluk River weir 2004 chum salmon escapement was above the 1992, 2000, 2002 and 2003 average escapement (Roettiger et al. *in press*).

The median passage date for chum salmon occurred on July 18, four days earlier than the historical average of July 21 (Gates and Harper 2003; Zabkar and Harper 2004). The early arrival may have been influenced by the extreme low water conditions. Similarly, the 2002 water level was the next lowest on record and chum salmon also returned with an early median passage date of July 17 (Gates and Harper 2003).

Sex composition was dominated by males, resulting in 43% females. All samples were dominated by males except for one sample in July and one in August, where females represented just over 50% (Appendix 3). Females made up less than 50% of the return in 2003, and this has continued into 2004. The percentage of females for years 1991-1994, and 2001-2003, ranges from 33 to 51%, with an average of 46% (Harper 1995 a,b,c; 1997; Gates and Harper 2002; 2003; Zabkar and Harper 2004).

The low percent females results from an increase of age 0.4 male chum salmon. The percentage of age 0.4 (46%) chum salmon returning in 2004 represented an increase compared to the last three years, and is similar to the percent of 0.4 chum salmon returning in the early 1990's. Males and females of age 0.4 represented 31% and 15% of the total escapement. Except for 1993, 2004 is the only year that the chum salmon age composition was dominated by age 0.4 (Harper 1995 a,b,c; 1997; Gates and Harper 2002; 2003; Zabkar and Harper 2004).

The high percentage of age 0.4 chum salmon were produced from the 1999 brood year. Although the escapement was not monitored, we assume there was a large return that year. As a result we have seen high returns of age 0.2 during 2002, age 0.3 during 2003, and high returns of age 0.4 during 2004 (Gates and Harper 2003; Zabkar and Harper 2004).

From 1991-1994, and 2002-2003, the difference between median cumulative passage dates for upstream migrants and downstream carcass passage at the weir ranged from 7 to 15 days. During all years, the median cumulative passage dates for carcasses occurred between July 31 and August 8 (Harper 1997; Gates and Harper 2002; 2003; Zabkar and Harper 2004).

Gill net marks (N=69) were observed on <1% of the chum salmon passing the weir, similar to 2003, which is the third lowest percentage of gill net marks observed at Tuluksak weir (Harper 1995 a,b,c; 1997; Gates and Harper 2002; 2003; Zabkar and Harper 2004).

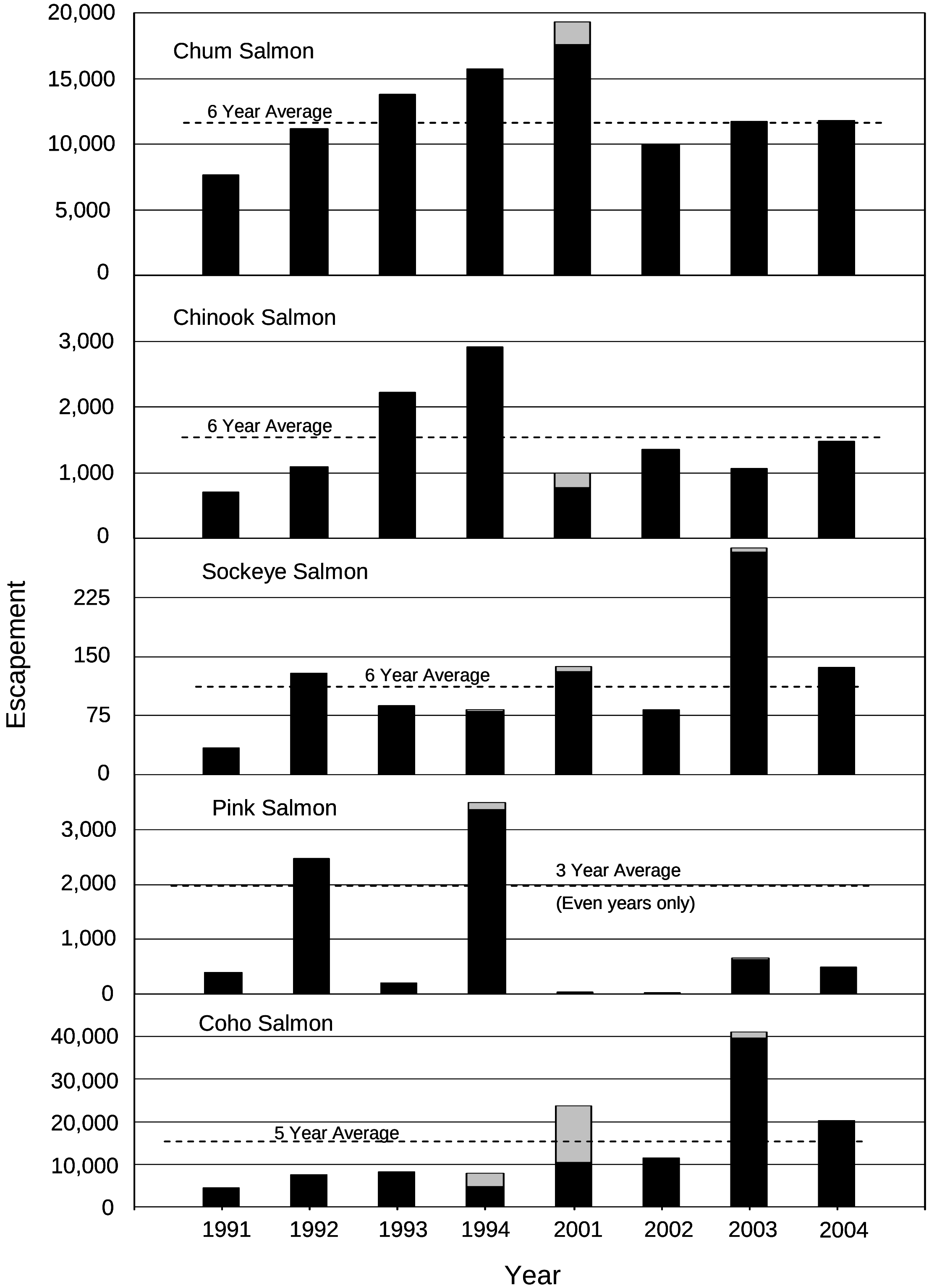

FIGURE 5.—Salmon escapements through the Tuluksak River weir, Alaska, 1991-1994, and 2001-2004. Note shading for estimated counts. Averages were calculated using only years with complete counts. The y-axis uses different scales.

Gill net marks were more frequently observed during years when a commercial harvest of chum salmon occurred in late June and early July, as confirmed in 1991 and 1992 (5% and 4%, respectively) when commercial fishing occurred. Commercial fishing did occur between June 30 and July 7 and Chinook, chum and sockeye salmon were harvested. The catch for all species was below the 10 year average (Whitmore et al. 2004). The commercial fishing periods did not appear to influence the amount of gill net marks observed at the weir (<1%).

Chinook Salmon—The Chinook salmon count during 2004 (N=1,475) was the third largest escapement on record, and 95% of the historical average (N=1,554) (Figure 5). Run timing in 2004 was average; the median passage date occurred one day before the average (Appendix 2). Chinook salmon median passage dates for all six years of weir operation are between July 5 and July 14 (Gates and Harper 2003; Zabkar and Harper 2004).

In previous years, Tuluksak River Chinook salmon returns were dominated by age 1.2, 1.3 and 1.4 fish, with age 1.3 the most prevalent. Similarly, the dominant age groups in 2004 were age 1.3 and 1.4, representing 41% and 33% of the total escapement. Age 1.4 represents the highest proportion since 1991, which also resulted in 33% of age 1.4 Chinook salmon (Harper 1995 a,b,c; 1997; Gates and Harper 2002; 2003; Zabkar and Harper 2004).

Due to the increase of age 1.4 fish that returned in 2004, the total percentage of Chinook salmon females (37%) during 2004 was the highest on record. In previous year's data, females have represented between 14 to 29%, with an average of 22% (Harper 1995 a,b,c; 1997; Gates and Harper 2002; 2003; Zabkar and Harper 2004).

Management actions may have led to the increase in percent females in the escapement. Similar to 2003, the 2004 subsistence fishing schedule maintained windows of fishing. These four day windows of fishing and three days of closure were designed to allow for an adequate subsistence harvest and for spawning escapement. According to test fish indices and subsistence harvest reports, Chinook and chum salmon were arriving average to early, and in strong numbers; therefore, on June 20, managers opened the subsistence fishing schedule to seven days per week. The schedule was rescinded 17 days earlier than in 2003. The strong return of Chinook and chum salmon allowed many Kuskokwim River tributaries to meet their escapement goals and subsistence users were able to harvest an adequate number of fish. The initial commercial fishing periods occurred between June 30 and July 7 and harvested Chinook, chum and sockeye salmon. The catch for all species was below the 10 year average (Whitmore et al. 2004).

Other escapement monitoring projects also confirmed that Kuskokwim River Chinook salmon returned in large numbers. The Chinook salmon Bethel test fishery was the highest on record for 2004 (Whitmore et al. 2004). Similarly, the Kwethluk River weir Chinook salmon escapement of 28,604 was the highest escapement on record (Roettiger et al. *in press*). Kogrukluk River weir exceeded the 5,300 – 14,000 Chinook salmon escapement goal with 19,503 Chinook salmon. This is the highest Chinook salmon escapement for Kogrukluk River weir on record since 1976 excluding 1995 (Whitmore et al. 2004).

Aerial surveys of Tuluksak River have been conducted by the Department sporadically since 1965 (Harper 1997; Ward et al. 2003). Optimal time for the Tuluksak River Chinook salmon aerial survey is late July. This time period coincides with more than 90% of upstream passage through the weir, and less than 10% of the carcasses passing downstream. During 2004, an aerial survey, conducted under excellent viewing conditions on July 27, estimated 1,196 Chinook salmon, which was 89% of the total escapement to date (J. Linderman, Alaska Department of

Fish and Game, personal communication). At the time of the 2004 aerial survey, 10% of the Chinook carcasses had passed down over the weir. An aerial survey goal for Tuluksak River Chinook salmon has not been established due a "lack of sufficient historical escapement and stock contribution data" (Alaska Department of Fish and Game 2004).

From 1991-1994, and 2002-2004, the difference between median cumulative passage dates for upstream migrants and downstream carcass passage at the weir ranged from 21 to 33 days. During all years, the median cumulative passage dates for carcasses occurred between August 2 and August 8 (Harper 1997; Gates and Harper 2002; 2003; Zabkar and Harper 2004).

Gill net marks (N=25) were observed on 2% of the Chinook salmon passing the weir. Historically gill net marks have ranged from 1 to 10% (Harper 1995 a,b,c; 1997; Gates and Harper 2002; 2003; Zabkar and Harper 2004). Similar to chum salmon, a higher percentage of gill net marks are typically present during years with commercial fishing periods occurring late June and early July (1991 and 1992; 10%) (Harper 1997). Chinook salmon were commercially harvested during 2004, however the amount of observed gill net marks at the weir remained similar to those years without a fishery.

Sockeye Salmon—The total number of sockeye salmon passing the Tuluksak River weir has been consistently small (N<150). The sockeye salmon escapement in 2004 (N=136) was slightly above the historical average (Figure 5). In 2004, other escapement projects located on the Kuskokwim River tributaries had variable sockeye salmon returns. The sockeye salmon return for Kwethluk River weir was the highest on record, and the sockeye salmon return for Kogrukluk River weir was below average (Roettiger et al. *in press*; Whitmore et al. 2004).

Fifty percent had passed the weir by July 15, one day after the earliest median passage date on record, and the same date for 2003 median passage. Median passage dates have previously ranged between July 14 and August 1 (1991-1994, 2001 and 2002) (Gates and Harper 2003; Zabkar and Harper 2004).

Since only a small population of sockeye salmon return to the Tuluksak River, there were no samples collected for age and length analysis.

Currently, sockeye are not actively managed in the lower Kuskokwim River commercial fishing districts from the mouth of the Kuskokwim River up to the village of Tuluksak (Ward et al. 2003). The 2004 commercial fishing periods harvested less than the recent 10-year average of sockeye salmon (Whitmore et al. 2004).

Pink Salmon—Kuskokwim River pink salmon have strong even-year runs (Francisco et al. 1992). This was observed between 1991 and 1994 where even years averaged 2,979 and odd years averaged 301 individuals (Figure 5). Commercial catches have averaged 4,028 during even years from 1992 to 2000 in Kuskokwim River Districts 1 and 2 (Ward et al. 2003). The estimated 2004 pink salmon escapement (N=496), was less than half the even year average escapements (N=1,995). Pink salmon even year escapements have ranged from 27 to 3,374 fish (1992, 1994, and 2002). The median passage of July 28 was within the range of even year median passage dates: August 7 in 1992, August 5 in 1994, and July 4 in 2002 (Harper 1995b; 1997; Gates and Harper 2003). Currently, no pink salmon escapement goals have been established and very little is known about the Kuskokwim River pink salmon stocks.

Coho Salmon—The 2004 coho salmon escapement was approximately 128% of the historical average. This return was the second highest escapement ever recorded for the Tuluksak River (Figure 5), not including years when passage estimates were included (1994 and 2001). Larger returns occurred in other Kuskokwim tributaries during 2004. Kwethluk River weir had the second highest return on record (Roettiger et al. *in press*). Tatlawiksuk River exhibited record coho salmon escapements in 2004 (Whitmore et al. 2004).

Run timing in 2004 was the earliest on record compared to all previous years of weir operations. The median passage date for coho salmon was August 19, ten days before the August 29 average (Appendix 2). The range of previous year's median passage dates were August 27 to September 5 (Gates and Harper 2003; Zabkar and Harper 2004).

Similar to past years, age 2.1 was the dominate age group for 2004, representing an estimated 96% of the escapement. Ages 1.1 and 3.1 were also present in the escapement. Age 2.1 has been the primary age group in all years of operations. Females age 2.1 in 2004 made up 31% of the escapement, resulting in the lowest portion of females for this age group observed in any year of operation. The low return on age 2.1 females resulted in the lowest percent of females on record (32%). The range of percent females in previous year's data was 43% to 58% (Harper 1995 a,b,c; 1997; Gates and Harper 2002; 2003; Zabkar and Harper 2004).

The percentage of gill net marks in the 2004 weir escapement (2%) compared to previous years, 1991, 1993, 2002, and 2003 where gill net marks were observed on 9%, 5%, 3%, and 2%, respectively (Harper 1995 a,c; Gates and Harper 2003; Zabkar and Harper 2004). Coho escapements for 1994 and 2001 were estimated; therefore the recorded gill net marks for these years is not an accurate representation. The number of gill net marks has decreased with the decrease of commercial fishing time and harvest of coho salmon. During 2004, strong returns of coho salmon to the Kuskokwim River resulted in a directed commercial fishery between July 28 and September 8, which harvested 25% more coho salmon than the 10-year average (Whitmore et al. 2004). As seen in the early 1990's the occurrence of gill net marks are typically higher with an increase of commercial harvest, however during 2004 a low number of gill net marks were observed at the weir.

Coho salmon carcasses were first recorded on August 4, 2004 and 28 coho salmon carcasses were passed over the weir by September 10, 2004. This is one fish greater than the amount observed during 2003, which was the highest carcass count of coho salmon observed on the Tuluksak River (Zabkar and Harper 2004). Carcass counts observed from 1991 to 1994, 2001, and 2002 ranged from 2 to 13 coho salmon (Harper 1997; Gates and Harper 2002; 2003).

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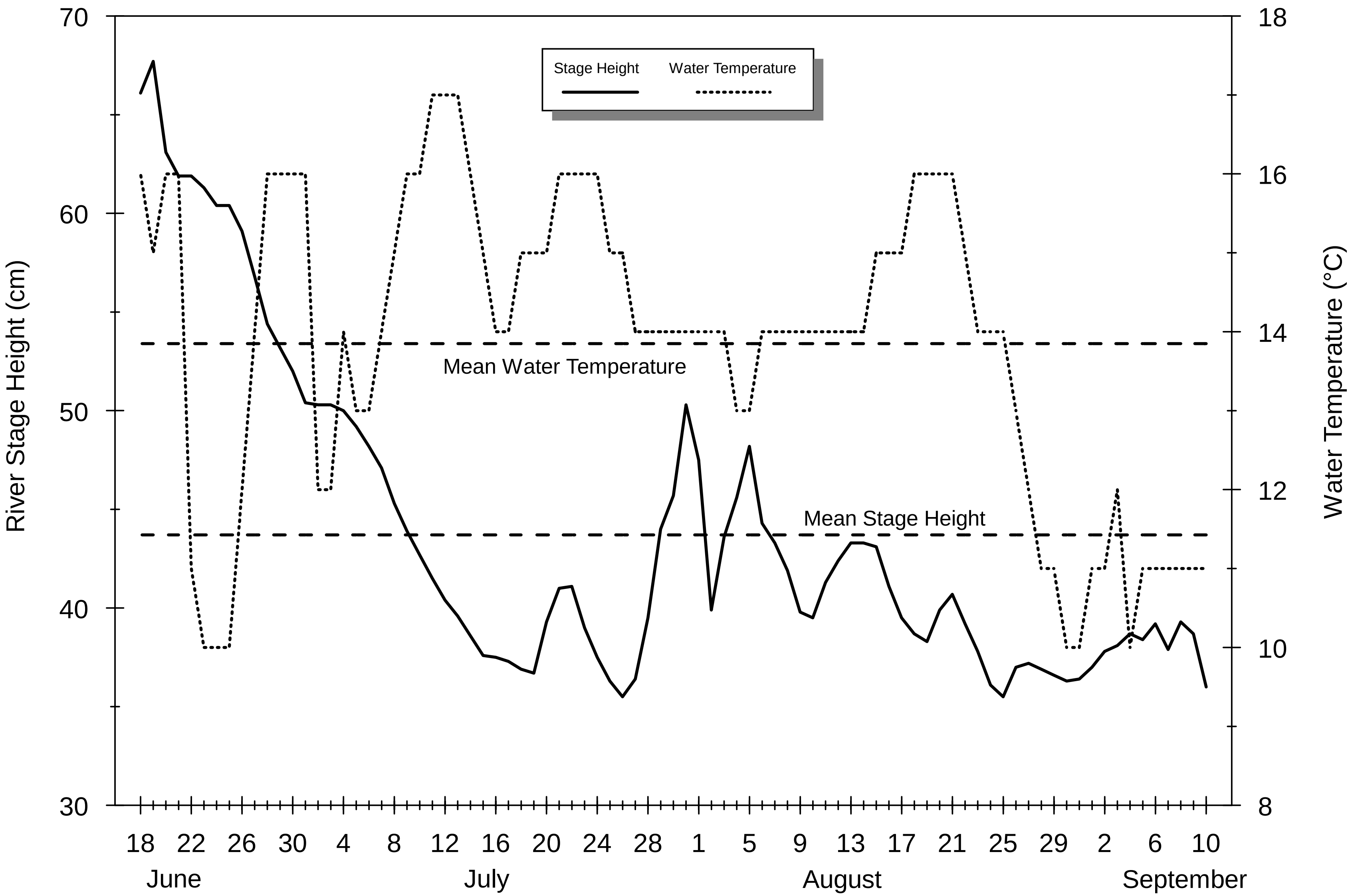

APPENDIX 1.—River stage heights and water temperatures at the Tuluksak River weir, 2004.

APPENDIX 2.—Daily, cumulative, and cumulative proportion of chum, Chinook, sockeye, pink, and coho salmon passing through the Tuluksak River weir, Alaska, 2004.

	Chum Salmon			Chinook Salmon			Sockeye Salmon			Pink Salmon			Coho Salmon		
	Daily	Cumulative		Daily	Cumulative		Daily	Cumulative		Daily	Cumulative		Daily	Cumulative	
	Count	Count	Proportion	Count	Count	Proportion	Count	Count	Proportion	Count	Count	Proportion	Count	Count	Proportion
06/22	0	0	0.0000	0	0	0.0000	0	0	0.0000	0	0	0.0000	0	0	0.0000
06/23	4	4	0.0003	0	0	0.0000	0	0	0.0000	0	0	0.0000	0	0	0.0000
06/24	9	13	0.0011	0	0	0.0000	0	0	0.0000	0	0	0.0000	0	0	0.0000
06/25	69	82	0.0070	0	0	0.0000	0	0	0.0000	0	0	0.0000	0	0	0.0000
06/26	85	167	0.0142	1	1	0.0007	0	0	0.0000	0	0	0.0000	0	0	0.0000
06/27	123	290	0.0246	5	6	0.0041	0	0	0.0000	0	0	0.0000	0	0	0.0000
06/28	322	612	0.0519	74	80	0.0542	0	0	0.0000	1	1	0.0020	0	0	0.0000
06/29	160	772	0.0654	34	114	0.0773	0	0	0.0000	1	2	0.0040	0	0	0.0000
06/30	796	1,568	0.1329	66	180	0.1220	0	0	0.0000	3	5	0.0101	0	0	0.0000
07/01	138	1,706	0.1446	75	255	0.1729	0	0	0.0000	0	5	0.0101	0	0	0.0000
07/02	1	1,707	0.1447	4	259	0.1756	0	0	0.0000	0	5	0.0101	0	0	0.0000
07/03	152	1,859	0.1576	93	352	0.2386	0	0	0.0000	0	5	0.0101	0	0	0.0000
07/04	477	2,336	0.1980	118	470	0.3186	4	4	0.0294	5	10	0.0202	0	0	0.0000
07/05	490	2,826	0.2396	19	489	0.3315	6	10	0.0735	2	12	0.0242	0	0	0.0000
07/06	395	3,221	0.2731	10	499	0.3383	4	14	0.1029	4	16	0.0323	0	0	0.0000
07/07	312	3,533	0.2995	28	527	0.3573	14	28	0.2059	10	26	0.0524	0	0	0.0000
07/08	363	3,896	0.3303	165	692	0.4692	18	46	0.3382	2	28	0.0565	0	0	0.0000
07/09	151	4,047	0.3431	16	708	0.4800	1	47	0.3456	5	33	0.0665	0	0	0.0000
07/10	75	4,122	0.3494	141	849	0.5756	3	50	0.3676	5	38	0.0766	0	0	0.0000
07/11	303	4,425	0.3751	72	921	0.6244	3	53	0.3897	2	40	0.0806	0	0	0.0000
07/12	339	4,764	0.4039	12	933	0.6325	3	56	0.4118	0	40	0.0806	0	0	0.0000
07/13	243	5,007	0.4245	29	962	0.6522	7	63	0.4632	2	42	0.0847	0	0	0.0000
07/14	349	5,356	0.4541	21	983	0.6664	4	67	0.4926	4	46	0.0927	1	1	0.0000
07/15	154	5,510	0.4671	19	1,002	0.6793	1	68	0.5000	0	46	0.0927	1	2	0.0001
07/16	114	5,624	0.4768	23	1,025	0.6949	2	70	0.5147	6	52	0.1048	0	2	0.0001
07/17	270	5,894	0.4997	21	1,046	0.7092	3	73	0.5368	13	65	0.1310	2	4	0.0002
07/18	685	6,579	0.5577	69	1,115	0.7559	12	85	0.6250	37	102	0.2056	0	4	0.0002
07/19	461	7,040	0.5968	10	1,125	0.7627	8	93	0.6838	14	116	0.2339	3	7	0.0003
07/20	388	7,428	0.6297	22	1,147	0.7776	9	102	0.7500	24	140	0.2823	14	21	0.0010
07/21	583	8,011	0.6791	29	1,176	0.7973	4	106	0.7794	34	174	0.3508	9	30	0.0015
07/22	361	8,372	0.7097	27	1,203	0.8156	2	108	0.7941	19	193	0.3891	3	33	0.0016
07/23	473	8,845	0.7498	111	1,314	0.8908	1	109	0.8015	18	211	0.4254	2	35	0.0017
07/24	341	9,186	0.7787	14	1,328	0.9003	0	109	0.8015	7	218	0.4395	5	40	0.0020
07/25	266	9,452	0.8013	19	1,347	0.9132	2	111	0.8162	8	226	0.4556	3	43	0.0021

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APPENDIX 2.—(Page 2 of 3)

	Chum Salmon			Chinook Salmon			Sockeye Salmon			Pink Salmon			Coho Salmon		
	Daily	Cumulative		Daily	Cumulative		Daily	Cumulative		Daily	Cumulative		Daily	Cumulative	
	Count	Count	Proportion	Count	Count	Proportion	Count	Count	Proportion	Count	Count	Proportion	Count	Count	Proportion
07/26	108	9,560	0.8104	2	1,349	0.9146	0	111	0.8162	5	231	0.4657	1	44	0.0022
07/27	83	9,643	0.8175	0	1,349	0.9146	1	112	0.8235	5	236	0.4758	5	49	0.0024
07/28	352	9,995	0.8473	9	1,358	0.9207	3	115	0.8456	20	256	0.5161	38	87	0.0043
07/29	203	10,198	0.8645	14	1,372	0.9302	2	117	0.8603	17	273	0.5504	56	143	0.0070
07/30	161	10,359	0.8782	22	1,394	0.9451	1	118	0.8676	7	280	0.5645	33	176	0.0087
07/31	188	10,547	0.8941	16	1,410	0.9559	3	121	0.8897	15	295	0.5948	61	237	0.0117
08/01	153	10,700	0.9071	13	1,423	0.9647	0	121	0.8897	10	305	0.6149	44	281	0.0138
08/02	95	10,795	0.9151	2	1,425	0.9661	0	121	0.8897	5	310	0.6250	43	324	0.0159
08/03	102	10,897	0.9238	5	1,430	0.9695	1	122	0.8971	5	315	0.6351	75	399	0.0196
08/04	81	10,978	0.9307	4	1,434	0.9722	0	122	0.8971	9	324	0.6532	64	463	0.0228
08/05	64	11,042	0.9361	11	1,445	0.9797	0	122	0.8971	5	329	0.6633	58	521	0.0256
08/06	116	11,158	0.9459	1	1,446	0.9803	1	123	0.9044	10	339	0.6835	316	837	0.0412
08/07	57	11,215	0.9507	5	1,451	0.9837	1	124	0.9118	9	348	0.7016	270	1,107	0.0544
08/08	34	11,249	0.9536	4	1,455	0.9864	0	124	0.9118	2	350	0.7056	74	1,181	0.0581
08/09	63	11,312	0.9590	0	1,455	0.9864	0	124	0.9118	5	355	0.7157	258	1,439	0.0708
08/10	37	11,349	0.9621	2	1,457	0.9878	0	124	0.9118	6	361	0.7278	247	1,686	0.0829
08/11	55	11,404	0.9668	5	1,462	0.9912	0	124	0.9118	7	368	0.7419	1,164	2,850	0.1401
08/12	42	11,446	0.9703	2	1,464	0.9925	0	124	0.9118	5	373	0.7520	157	3,007	0.1479
08/13	41	11,487	0.9738	1	1,465	0.9932	1	125	0.9191	6	379	0.7641	204	3,211	0.1579
08/14	64	11,551	0.9792	1	1,466	0.9939	1	126	0.9265	6	385	0.7762	843	4,054	0.1994
08/15	27	11,578	0.9815	1	1,467	0.9946	1	127	0.9338	8	393	0.7923	956	5,010	0.2464
08/16	24	11,602	0.9836	4	1,471	0.9973	1	128	0.9412	3	396	0.7984	731	5,741	0.2823
08/17	27	11,629	0.9858	0	1,471	0.9973	1	129	0.9485	3	399	0.8044	806	6,547	0.3219
08/18	38	11,667	0.9891	0	1,471	0.9973	0	129	0.9485	14	413	0.8327	1,900	8,447	0.4154
08/19	31	11,698	0.9917	2	1,473	0.9986	1	130	0.9559	8	421	0.8488	2,142	10,589	0.5207
08/20	13	11,711	0.9928	1	1,474	0.9993	0	130	0.9559	8	429	0.8649	266	10,855	0.5338
08/21	15	11,726	0.9941	1	1,475	1.0000	0	130	0.9559	13	442	0.8911	1,958	12,813	0.6301
08/22	1	11,727	0.9942	0	1,475	1.0000	0	130	0.9559	1	443	0.8931	227	13,040	0.6412
08/23	3	11,730	0.9944	0	1,475	1.0000	0	130	0.9559	1	444	0.8952	74	13,114	0.6449
08/24	8	11,738	0.9951	0	1,475	1.0000	1	131	0.9632	4	448	0.9032	593	13,707	0.6740
08/25	7	11,745	0.9957	0	1,475	1.0000	0	131	0.9632	7	455	0.9173	1,329	15,036	0.7394
08/26	7	11,752	0.9963	0	1,475	1.0000	0	131	0.9632	4	459	0.9254	647	15,683	0.7712
08/27	4	11,756	0.9966	0	1,475	1.0000	1	132	0.9706	0	459	0.9254	203	15,886	0.7812
08/28	6	11,762	0.9971	0	1,475	1.0000	1	133	0.9779	2	461	0.9294	34	15,920	0.7828

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APPENDIX 2.—(Page 3 of 3)

	Chum Salmon			Chinook Salmon			Sockeye Salmon			Pink Salmon			Coho Salmon		
	Daily	Cumulative		Daily	Cumulative		Daily	Cumulative		Daily	Cumulative		Daily	Cumulative	
	Count	Count	Proportion	Count	Count	Proportion	Count	Count	Proportion	Count	Count	Proportion	Count	Count	Proportion
08/29	7	11,769	0.9977	0	1,475	1.0000	0	133	0.9779	2	463	0.9335	9	15,929	0.7833
08/30	4	11,773	0.9981	0	1,475	1.0000	0	133	0.9779	4	467	0.9415	53	15,982	0.7859
08/31	4	11,777	0.9984	0	1,475	1.0000	0	133	0.9779	3	470	0.9476	127	16,109	0.7921
09/01	6	11,783	0.9989	0	1,475	1.0000	2	135	0.9926	2	472	0.9516	925	17,034	0.8376
09/02	1	11,784	0.9990	0	1,475	1.0000	0	135	0.9926	9	481	0.9698	1,419	18,453	0.9074
09/03	4	11,788	0.9993	0	1,475	1.0000	0	135	0.9926	1	482	0.9718	340	18,793	0.9241
09/04	1	11,789	0.9994	0	1,475	1.0000	0	135	0.9926	3	485	0.9778	5	18,798	0.9244
09/05	1	11,790	0.9995	0	1,475	1.0000	0	135	0.9926	3	488	0.9839	207	19,005	0.9345
09/06	4	11,794	0.9998	0	1,475	1.0000	0	135	0.9926	5	493	0.9940	277	19,282	0.9482
09/07	1	11,795	0.9999	0	1,475	1.0000	1	136	1.0000	0	493	0.9940	282	19,564	0.9620
09/08	0	11,795	0.9999	0	1,475	1.0000	0	136	1.0000	1	494	0.9960	198	19,762	0.9718
09/09	0	11,795	0.9999	0	1,475	1.0000	0	136	1.0000	2	496	1.0000	150	19,912	0.9792
09/10	1	11,796	1.0000	0	1,475	1.0000	0	136	1.0000	0	496	1.0000	424	20,336	1.0000

APPENDIX 3.—Estimated age and sex composition of weekly chum salmon escapements through the Tuluksak River weir, Alaska, 2004, and estimated design effects of the stratified sampling design.

		Brood Year and Age Group					
		2001	2000	1999	1998	1997	
		0.2	0.3	0.4	0.5	0.6	Total
Stratum 1:	06/20 - 06/26						
Sampling Dates:	06/23, 06/24 & 06/26						
Male:	Number in Sample:	0	8	28	1	0	37
	Estimated % of Escapement:	0.0	14.3	50.0	1.8	0.0	66.1
	Estimated Escapement:	0	24	84	3	0	110
	Standard Error:	0.0	6.4	9.2	2.4	0.0	
Female:	Number in Sample:	0	6	13	0	0	19
	Estimated % of Escapement:	0.0	10.7	23.2	0.0	0.0	33.9
	Estimated Escapement:	0	18	39	0	0	57
	Standard Error:	0.0	5.7	7.8	0.0	0.0	
Total:	Number in Sample:	0	14	41	1	0	56
	Estimated % of Escapement:	0.0	25.0	73.2	1.8	0.0	100.0
	Estimated Escapement:	0	42	122	3	0	167
	Standard Error:	0.0	7.9	8.1	2.4	0.0	
Stratum 2:	06/27 - 07/03						
Sampling Dates:	06/27 - 06/30						
Male:	Number in Sample:	1	19	103	2	0	125
	Estimated % of Escapement:	0.5	10.0	54.2	1.1	0.0	65.8
	Estimated Escapement:	9	169	917	18	0	1,113
	Standard Error:	8.4	34.8	57.8	11.8	0.0	
Female:	Number in Sample:	1	14	49	0	1	65
	Estimated % of Escapement:	0.5	7.4	25.8	0.0	0.5	34.2
	Estimated Escapement:	9	125	436	0	9	579
	Standard Error:	8.4	30.3	50.7	0.0	8.4	
Total:	Number in Sample:	2	33	152	2	1	190
	Estimated % of Escapement:	1.1	17.4	80.0	1.1	0.5	100.0
	Estimated Escapement:	18	294	1,354	18	9	1,692
	Standard Error:	11.8	43.9	46.4	11.8	8.4	
Stratum 3:	07/04 - 07/10						
Sampling Dates:	07/04 & 07/05						
Male:	Number in Sample:	2	33	84	0	0	119
	Estimated % of Escapement:	1.0	17.2	43.8	0.0	0.0	62.0
	Estimated Escapement:	24	389	990	0	0	1,403
	Standard Error:	15.9	59.1	77.7	0.0	0.0	
Female:	Number in Sample:	3	32	38	0	0	73
	Estimated % of Escapement:	1.6	16.7	19.8	0.0	0.0	38.0
	Estimated Escapement:	35	377	448	0	0	860
	Standard Error:	19.4	58.4	62.4	0.0	0.0	
Total:	Number in Sample:	5	65	122	0	0	192
	Estimated % of Escapement:	2.6	33.9	63.5	0.0	0.0	100.0
	Estimated Escapement:	59	766	1,438	0	0	2,263
	Standard Error:	24.9	74.1	75.4	0.0	0.0	

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APPENDIX 3.—(Page 2 of 3)

		Brood Year and Age Group					
		2001	2000	1999	1998	1997	
		0.2	0.3	0.4	0.5	0.6	Total
Stratum 4:	07/11 - 07/17						
Sampling Dates:	07/12 & 07/13						
Male:	Number in Sample:	19	40	56	1	0	116
	Estimated % of Escapement:	10.5	22.1	30.9	0.6	0.0	64.1
	Estimated Escapement:	186	392	548	10	0	1,136
	Standard Error:	38.4	51.9	57.8	9.3	0.0	
Female:	Number in Sample:	9	31	25	0	0	65
	Estimated % of Escapement:	5.0	17.1	13.8	0.0	0.0	35.9
	Estimated Escapement:	88	303	245	0	0	636
	Standard Error:	27.2	47.1	43.2	0.0	0.0	
Total:	Number in Sample:	28	71	81	1	0	181
	Estimated % of Escapement:	15.5	39.2	44.8	0.6	0.0	100.0
	Estimated Escapement:	274	695	793	10	0	1,772
	Standard Error:	45.3	61.1	62.2	9.3	0.0	
Stratum 5:	07/18 - 07/24						
Sampling Dates:	07/19						
Male:	Number in Sample:	18	31	41	0	0	90
	Estimated % of Escapement:	9.6	16.6	21.9	0.0	0.0	48.1
	Estimated Escapement:	317	546	722	0	0	1,584
	Standard Error:	69.1	87.2	97.0	0.0	0.0	
Female:	Number in Sample:	25	51	21	0	0	97
	Estimated % of Escapement:	13.4	27.3	11.2	0.0	0.0	51.9
	Estimated Escapement:	440	898	370	0	0	1,708
	Standard Error:	79.8	104.4	74.0	0.0	0.0	
Total:	Number in Sample:	43	82	62	0	0	187
	Estimated % of Escapement:	23.0	43.9	33.2	0.0	0.0	100.0
	Estimated Escapement:	757	1,444	1,091	0	0	3,292
	Standard Error:	98.6	116.3	110.4	0.0	0.0	
Stratum 6:	07/25 - 07/31						
Sampling Dates:	07/26 - 07/28						
Male:	Number in Sample:	38	45	30	0	0	113
	Estimated % of Escapement:	20.4	24.2	16.1	0.0	0.0	60.8
	Estimated Escapement:	278	329	220	0	0	827
	Standard Error:	37.5	39.8	34.2	0.0	0.0	
Female:	Number in Sample:	34	27	12	0	0	73
	Estimated % of Escapement:	18.3	14.5	6.5	0.0	0.0	39.2
	Estimated Escapement:	249	198	88	0	0	534
	Standard Error:	35.9	32.8	22.8	0.0	0.0	
Total:	Number in Sample:	72	72	42	0	0	186
	Estimated % of Escapement:	38.7	38.7	22.6	0.0	0.0	100.0
	Estimated Escapement:	527	527	307	0	0	1,361
	Standard Error:	45.3	45.3	38.9	0.0	0.0	

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APPENDIX 3.—(Page 3 of 3)

		Brood Year and Age Group					
		2001	2000	1999	1998	1997	
		0.2	0.3	0.4	0.5	0.6	Total
Strata 7 & 8:	08/01 - 08/14						
Sampling Dates:	08/02 - 08/04 & 08/10						
Male:	Number in Sample:	35	27	26	0	0	88
	Estimated % of Escapement:	18.5	14.3	13.8	0.0	0.0	46.6
	Estimated Escapement:	186	143	138	0	0	467
	Standard Error:	25.6	23.1	22.7	0.0	0.0	
Female:	Number in Sample:	49	33	19	0	0	101
	Estimated % of Escapement:	25.9	17.5	10.1	0.0	0.0	53.4
	Estimated Escapement:	260	175	101	0	0	537
	Standard Error:	28.9	25.0	19.8	0.0	0.0	
Total:	Number in Sample:	84	60	45	0	0	189
	Estimated % of Escapement:	44.4	31.7	23.8	0.0	0.0	100.0
	Estimated Escapement:	446	319	239	0	0	1,004
	Standard Error:	32.8	30.7	28.1	0.0	0.0	
Stratum 9:	08/15 - 08/21						
No Samples Collected							
Strata 10 & 11:	08/22 - 09/04						
Sampling Dates:	08/23, 08/24 & 09/04						
Male:	Number in Sample:	0	2	1	0	0	3
	Estimated % of Escapement:	0.0	33.3	16.7	0.0	0.0	50.0
	Estimated Escapement:	0	21	11	0	0	32
	Standard Error:	0.0	12.6	10.0	0.0	0.0	
Female:	Number in Sample:	2	1	0	0	0	3
	Estimated % of Escapement:	33.3	16.7	0.0	0.0	0.0	50.0
	Estimated Escapement:	21	11	0	0	0	32
	Standard Error:	12.6	10.0	0.0	0.0	0.0	
Total:	Number in Sample:	2	3	1	0	0	6
	Estimated % of Escapement:	33.3	50.0	16.7	0.0	0.0	100.0
	Estimated Escapement:	21	32	11	0	0	63
	Standard Error:	12.6	13.4	10.0	0.0	0.0	
Stratum 12:	09/05 - 09/11						
No Samples Collected							
Strata 1 - 12:	06/20 - 09/11						
Sampling Dates:	06/23 - 09/04						
Male:	Number in Sample:	113	205	369	4	0	691
	% Males in Age Group:	15.0	30.2	54.4	0.5	0.0	100.0
	Estimated % of Escapement:	8.6	17.3	31.2	0.3	0.0	57.4
	Estimated Escapement:	999	2,013	3,629	31	0	6,672
	Standard Error:	92.9	131.6	154.9	15.2	0.0	
	Estimated Design Effects:	1.062	1.164	1.076	0.879	0.000	1.163
Female:	Number in Sample:	123	195	177	0	1	496
	% Females in Age Group:	22.3	42.6	34.9	0.0	0.2	100.0
	Estimated % of Escapement:	9.5	18.1	14.9	0.0	0.1	42.6
	Estimated Escapement:	1,103	2,104	1,726	0	9	4,942
	Standard Error:	99.2	138.9	121.6	0.0	8.4	
	Estimated Design Effects:	1.102	1.242	1.127	0.000	0.910	1.163
Total:	Number in Sample:	236	400	546	4	1	1,187
	Estimated % of Escapement:	18.1	35.5	46.1	0.3	0.1	100.0
	Estimated Escapement:	2,102	4,117	5,355	31	9	11,614 *
	Standard Error:	125.8	167.1	162.3	15.2	8.4	
	Estimated Design Effects:	1.027	1.172	1.019	0.879	0.910	

* 182 fish that were counted through the weir during strata 9 & 12 are not included in this total.

APPENDIX 4.—Estimated length at age composition of weekly chum salmon escapements through the Tuluksak River weir, Alaska, 2004.

		Brood Year and Age Group				
		2001	2000	1999	1998	1997
		0.2	0.3	0.4	0.5	0.6
Stratum 1:	06/20 - 06/26					
Sampling Dates:	06/23, 06/24 & 06/26					
Male:	Mean Length		596	609	620	
	Std. Error		14	5		
	Range		540- 650	555- 660		
	Sample Size	0	8	28	1	0
Female:	Mean Length		576	585		
	Std. Error		12	7		
	Range		535- 615	530- 615		
	Sample Size	0	6	13	0	0
Stratum 2:	06/27 - 07/03					
Sampling Dates:	06/27 - 06/30					
Male:	Mean Length	570	589	604	560	
	Std. Error		6	2	10	
	Range		540- 630	545- 665	550- 570	
	Sample Size	1	19	103	2	0
Female:	Mean Length	525	568	570		590
	Std. Error		6	2		
	Range		540- 610	530- 600		
	Sample Size	1	14	49	0	1
Stratum 3:	07/04 - 07/10					
Sampling Dates:	07/04 & 07/05					
Male:	Mean Length	543	580	600		
	Std. Error	23	6	3		
	Range	520- 565	510- 655	540- 670		
	Sample Size	2	33	84	0	0
Female:	Mean Length	528	556	563		
	Std. Error	7	4	4		
	Range	515- 540	515- 600	520- 610		
	Sample Size	3	32	38	0	0
Stratum 4:	07/11 - 07/17					
Sampling Dates:	07/12 & 07/13					
Male:	Mean Length	536	571	594	575	
	Std. Error	5	5	4		
	Range	500- 575	510- 650	520- 670		
	Sample Size	19	40	56	1	0
Female:	Mean Length	522	543	561		
	Std. Error	9	5	10		
	Range	470- 550	510- 610	500- 770		
	Sample Size	9	31	25	0	0

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APPENDIX 4.—(Page 2 of 3)

		Brood Year and Age Group				
		2001	2000	1999	1998	1997
		0.2	0.3	0.4	0.5	0.6
Stratum 5:	07/18 - 07/24					
Sampling Dates:	07/19					
Male:	Mean Length	544	562	577		
	Std. Error	3	4	5		
	Range	520- 570	500- 605	490- 640		
	Sample Size	18	31	41	0	0
Female:	Mean Length	512	545	546		
	Std. Error	5	4	7		
	Range	475- 550	470- 605	465- 600		
	Sample Size	25	51	21	0	0
Stratum 6:	07/25 - 07/31					
Sampling Dates:	07/26 - 07/28					
Male:	Mean Length	531	571	576		
	Std. Error	4	6	7		
	Range	460- 580	500- 695	470- 650		
	Sample Size	38	45	30	0	0
Female:	Mean Length	514	529	554		
	Std. Error	4	6	9		
	Range	450- 560	455- 610	480- 600		
	Sample Size	34	27	12	0	0
Strata 7 & 8:	08/01 - 08/14					
Sampling Dates:	08/02 - 08/04 & 08/10					
Male:	Mean Length	523	553	570		
	Std. Error	5	6	7		
	Range	450- 570	470- 600	500- 650		
	Sample Size	35	27	26	0	0
Female:	Mean Length	502	516	537		
	Std. Error	3	4	8		
	Range	450- 545	460- 565	450- 595		
	Sample Size	49	33	19	0	0
Stratum 9:	08/15 - 08/23					
No Samples Collected						
Strata 10 & 11:	08/22 - 09/04					
Sampling Dates:	08/23, 08/24 & 09/04					
Male:	Mean Length		578	620		
	Std. Error		23			
	Range		555- 600			
	Sample Size	0	2	1	0	0
Female:	Mean Length	488	565			
	Std. Error	23				
	Range	465- 510				
	Sample Size	2	1	0	0	0

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		Brood Year and Age Group				
		2001	2000	1999	1998	1997
		0.2	0.3	0.4	0.5	0.6
Stratum 12:	09/05 - 09/11					
No Samples Collected						
Strata 1 - 12:	06/20 - 09/11					
Sampling Dates:	06/23 - 09/04					
Male:	Mean Length	535	571	593	571	
	Std. Error	2	2	2	10	
	Range	450- 580	470- 695	470- 670	550- 620	
	Sample Size	113	205	369	4	0
Female:	Mean Length	511	544	559		590
	Std. Error	2	2	3		
	Range	450- 560	455- 615	450- 770		
	Sample Size	123	195	177	0	1

APPENDIX 5.—Estimated age and sex composition of weekly Chinook salmon escapements through the Tuluksak River weir, Alaska, 2004, and estimated design effects of the stratified sampling design.

		Brood Year and Age Group						
		2001	2000	1999		1998	1997	
		1.1	1.2	1.3	2.2	1.4	1.5	Total
Stratum 1:	06/20 - 06/26							
No Samples Collected								
Stratum 2:	06/27 - 07/03							
Sampling Dates:	06/28 - 06/30 & 07/01							
Male:	Number in Sample:	1	21	26	0	2	0	50
	Estimated % of Escapement:	1.3	26.9	33.3	0.0	2.6	0.0	64.1
	Estimated Escapement:	5	95	117	0	9	0	225
	Standard Error:	4.0	15.6	16.6	0.0	5.6	0.0	
Female:	Number in Sample:	0	4	11	0	11	2	28
	Estimated % of Escapement:	0.0	5.1	14.1	0.0	14.1	2.6	35.9
	Estimated Escapement:	0	18	50	0	50	9	126
	Standard Error:	0.0	7.8	12.3	0.0	12.3	5.6	
Total:	Number in Sample:	1	25	37	0	13	2	78
	Estimated % of Escapement:	1.3	32.1	47.4	0.0	16.7	2.6	100.0
	Estimated Escapement:	5	113	167	0	59	9	351
	Standard Error:	4.0	16.5	17.6	0.0	13.1	5.6	
Stratum 3:	07/04 - 07/10							
Sampling Dates:	07/04 - 07/10							
Male:	Number in Sample:	0	22	29	0	10	1	62
	Estimated % of Escapement:	0.0	26.2	34.5	0.0	11.9	1.2	73.8
	Estimated Escapement:	0	130	172	0	59	6	367
	Standard Error:	0.0	21.9	23.6	0.0	16.1	5.4	
Female:	Number in Sample:	0	1	3	0	18	0	22
	Estimated % of Escapement:	0.0	1.2	3.6	0.0	21.4	0.0	26.2
	Estimated Escapement:	0	6	18	0	107	0	130
	Standard Error:	0.0	5.4	9.2	0.0	20.4	0.0	
Total:	Number in Sample:	0	23	32	0	28	1	84
	Estimated % of Escapement:	0.0	27.4	38.1	0.0	33.3	1.2	100.0
	Estimated Escapement:	0	136	189	0	166	6	497
	Standard Error:	0.0	22.2	24.1	0.0	23.4	5.4	
Stratum 4:	07/11 - 07/17							
Sampling Dates:	07/12 - 07/14							
Male:	Number in Sample:	1	7	13	0	0	0	21
	Estimated % of Escapement:	3.0	21.2	39.4	0.0	0.0	0.0	63.6
	Estimated Escapement:	6	42	78	0	0	0	125
	Standard Error:	5.4	13.0	15.5	0.0	0.0	0.0	
Female:	Number in Sample:	0	1	2	0	9	0	12
	Estimated % of Escapement:	0.0	3.0	6.1	0.0	27.3	0.0	36.4
	Estimated Escapement:	0	6	12	0	54	0	72
	Standard Error:	0.0	5.4	7.6	0.0	14.2	0.0	
Total:	Number in Sample:	1	8	15	0	9	0	33
	Estimated % of Escapement:	3.0	24.2	45.5	0.0	27.3	0.0	100.0
	Estimated Escapement:	6	48	90	0	54	0	197
	Standard Error:	5.4	13.6	15.8	0.0	14.2	0.0	

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		Brood Year and Age Group						
		2001	2000	1999		1998	1997	
		1.1	1.2	1.3	2.2	1.4	1.5	Total
Stratum 5:	07/18 - 07/24							
Sampling Dates:	07/19 - 07/23							
Male:	Number in Sample:	0	7	19	0	4	0	30
	Estimated % of Escapement:	0.0	13.0	35.2	0.0	7.4	0.0	55.6
	Estimated Escapement:	0	37	99	0	21	0	157
	Standard Error:	0.0	11.7	16.6	0.0	9.1	0.0	
Female:	Number in Sample:	0	1	5	0	18	0	24
	Estimated % of Escapement:	0.0	1.9	9.3	0.0	33.3	0.0	44.4
	Estimated Escapement:	0	5	26	0	94	0	125
	Standard Error:	0.0	4.7	10.1	0.0	16.4	0.0	
Total:	Number in Sample:	0	8	24	0	22	0	54
	Estimated % of Escapement:	0.0	14.8	44.4	0.0	40.7	0.0	100.0
	Estimated Escapement:	0	42	125	0	115	0	282
	Standard Error:	0.0	12.4	17.3	0.0	17.1	0.0	
Strata 6 - 8:	07/25 - 08/14							
Sampling Dates:	07/26, 08/02 - 08/04 & 08/10							
Male:	Number in Sample:	0	1	1	0	0	0	2
	Estimated % of Escapement:	0.0	16.7	16.7	0.0	0.0	0.0	33.3
	Estimated Escapement:	0	23	23	0	0	0	46
	Standard Error:	0.0	22.5	22.5	0.0	0.0	0.0	
Female:	Number in Sample:	0	0	0	0	4	0	4
	Estimated % of Escapement:	0.0	0.0	0.0	0.0	66.7	0.0	66.7
	Estimated Escapement:	0	0	0	0	92	0	92
	Standard Error:	0.0	0.0	0.0	0.0	28.5	0.0	
Total:	Number in Sample:	0	1	1	0	4	0	6
	Estimated % of Escapement:	0.0	16.7	16.7	0.0	66.7	0.0	100.0
	Estimated Escapement:	0	23	23	0	92	0	138
	Standard Error:	0.0	22.5	22.5	0.0	28.5	0.0	
Strata 9 - 12:	08/15 - 09/11							
No Samples Collected								
Strata 1 - 12:	06/20 - 09/11							
Sampling Dates:	06/28 - 08/10							
Male:	Number in Sample:	2	58	88	0	16	1	165
	% Males in Age Group:	1.1	35.4	53.1	0.0	9.7	0.6	100.0
	Estimated % of Escapement:	0.7	22.3	33.3	0.0	6.1	0.4	62.8
	Estimated Escapement:	10	326	488	0	89	6	920
	Standard Error:	6.7	39.2	43.1	0.0	19.3	5.4	
	Estimated Design Effects:	0.932	1.225	1.166	0.000	0.943	1.030	1.236
Female:	Number in Sample:	0	7	21	0	60	2	90
	% Females in Age Group:	0.0	6.4	19.3	0.0	72.6	1.7	100.0
	Estimated % of Escapement:	0.0	2.4	7.2	0.0	27.0	0.6	37.2
	Estimated Escapement:	0	35	105	0	396	9	545
	Standard Error:	0.0	11.9	19.9	0.0	43.0	5.6	
	Estimated Design Effects:	0.000	0.889	0.872	0.000	1.270	0.775	1.236
Total:	Number in Sample:	2	65	109	0	76	3	255
	Estimated % of Escapement:	0.7	24.6	40.5	0.0	33.1	1.0	100.0
	Estimated Escapement:	10	361	594	0	485	15	1,465 *
	Standard Error:	6.7	40.1	44.2	0.0	45.0	7.8	
	Estimated Design Effects:	0.932	1.199	1.130	0.000	1.247	0.880	

* 10 fish that were counted through the weir during stratum 1 & 9 - 12 are not included in this total.

APPENDIX 6.—Estimated length at age composition of weekly Chinook salmon escapements through the Tuluksak River weir, Alaska, 2004.

		Brood Year and Age Group					
		2001	2000	1999		1998	1997
		1.1	1.2	1.3	2.2	1.4	1.5
Stratum 1:	06/20 - 06/26						
No Samples Collected							
Stratum 2:	06/27 - 07/03						
Sampling Dates:	06/28 - 06/30 & 07/01						
Male:	Mean Length	355	586	693		693	
	Std. Error		7	9		18	
	Range		535- 655	590- 770		675- 710	
	Sample Size	1	21	26	0	2	0
Female:	Mean Length		591	750		853	875
	Std. Error		17	13		17	10
	Range		550- 630	690- 820		745- 920	865- 885
	Sample Size	0	4	11	0	11	2
Stratum 3:	07/04 - 07/10						
Sampling Dates:	07/04 - 07/10						
Male:	Mean Length		593	720		803	1160
	Std. Error		9	15		20	
	Range		510- 690	555- 945		730- 960	
	Sample Size	0	22	29	0	10	1
Female:	Mean Length		570	802		861	
	Std. Error			8		15	
	Range			785- 810		750-1000	
	Sample Size	0	1	3	0	18	0
Stratum 4:	07/11 - 07/17						
Sampling Dates:	07/12 - 07/14						
Male:	Mean Length	395	606	705			
	Std. Error		19	12			
	Range		535- 675	635- 790			
	Sample Size	1	7	13	0	0	0
Female:	Mean Length		620	888		883	
	Std. Error			73		16	
	Range			815- 960		800- 980	
	Sample Size	0	1	2	0	9	0
Stratum 5:	07/18 - 07/24						
Sampling Dates:	07/19 - 07/23						
Male:	Mean Length		639	703		886	
	Std. Error		23	14		80	
	Range		515- 685	620- 820		715-1100	
	Sample Size	0	7	19	0	4	0
Female:	Mean Length		600	763		876	
	Std. Error			17		14	
	Range			710- 810		790-1010	
	Sample Size	0	1	5	0	18	0

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		Brood Year and Age Group					
		2001	2000	1999		1998	1997
		1.1	1.2	1.3	2.2	1.4	1.5
Strata 6 - 8:	07/25 - 08/14						
Sampling Dates:	07/26, 08/02 - 08/04 & 08/10						
Male:	Mean Length		400	670			
	Std. Error						
	Range						
	Sample Size	0	1	1	0	0	0
Female:	Mean Length					863	
	Std. Error					19	
	Range					840- 920	
	Sample Size	0	0	0	0	4	0
Strata 9 - 12:	08/15 - 09/11						
No Samples Collected							
Strata 1 - 12:	06/20 - 09/11						
Sampling Dates:	06/28 - 08/10						
Male:	Mean Length	378	584	706		811	1160
	Std. Error		6	7		23	
	Range	355- 395	400- 690	555- 945		675-1100	
	Sample Size	2	58	88	0	16	1
Female:	Mean Length		594	778		867	875
	Std. Error		17	11		8	10
	Range		550- 630	690- 960		745-1010	865- 885
	Sample Size	0	7	21	0	60	2

APPENDIX 7.—Estimated age and sex composition of weekly coho salmon escapements through the Tuluksak River weir, Alaska, 2004, and estimated design effects of the stratified sampling design.

		Brood Year and Age Group				
		2001	2000	1999		
		1.1	2.1	2.2	3.1	Total
Strata 1 - 7:	06/20 - 08/07					
No Samples Collected						
Stratum 8:	08/08 - 08/14					
Sampling Dates:	08/10					
Male:	Number in Sample:	0	38	0	2	40
	Estimated % of Escapement:	0.0	60.3	0.0	3.2	63.5
	Estimated Escapement:	0	1,778	0	94	1,871
	Standard Error:	0.0	181.1	0.0	64.9	
Female:	Number in Sample:	0	23	0	0	23
	Estimated % of Escapement:	0.0	36.5	0.0	0.0	36.5
	Estimated Escapement:	0	1,076	0	0	1,076
	Standard Error:	0.0	178.3	0.0	0.0	
Total:	Number in Sample:	0	61	0	2	63
	Estimated % of Escapement:	0.0	96.8	0.0	3.2	100.0
	Estimated Escapement:	0	2,853	0	94	2,947
	Standard Error:	0.0	64.9	0.0	64.9	
Stratum 9:	08/15 - 08/21					
No Samples Collected						
Stratum 10:	08/22 - 08/28					
Sampling Dates:	08/23 & 08/24					
Male:	Number in Sample:	0	32	0	2	34
	Estimated % of Escapement:	0.0	56.1	0.0	3.5	59.6
	Estimated Escapement:	0	1,744	0	109	1,853
	Standard Error:	0.0	204.1	0.0	75.7	
Female:	Number in Sample:	0	22	0	1	23
	Estimated % of Escapement:	0.0	38.6	0.0	1.8	40.4
	Estimated Escapement:	0	1,199	0	55	1,254
	Standard Error:	0.0	200.3	0.0	54.0	
Total:	Number in Sample:	0	54	0	3	57
	Estimated % of Escapement:	0.0	94.7	0.0	5.3	100.0
	Estimated Escapement:	0	2,943	0	164	3,107
	Standard Error:	0.0	91.9	0.0	91.9	
Strata 11 & 12:	08/29 - 09/11					
Sampling Dates:	09/04 & 09/05					
Male:	Number in Sample:	1	47	0	1	49
	Estimated % of Escapement:	1.6	73.4	0.0	1.6	76.6
	Estimated Escapement:	69	3,243	0	69	3,381
	Standard Error:	68.5	243.9	0.0	68.5	
Female:	Number in Sample:	1	14	0	0	15
	Estimated % of Escapement:	1.6	21.9	0.0	0.0	23.4
	Estimated Escapement:	69	966	0	0	1,035
	Standard Error:	68.5	228.3	0.0	0.0	
Total:	Number in Sample:	2	61	0	1	64
	Estimated % of Escapement:	3.1	95.3	0.0	1.6	100.0
	Estimated Escapement:	138	4,209	0	69	4,416
	Standard Error:	96.1	116.7	0.0	68.5	

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		Brood Year and Age Group				
		2001	2000	1999		
		1.1	2.1	2.2	3.1	Total
Strata 1 - 12:	06/20 - 09/11					
Sampling Dates:	08/10 - 09/05					
Male:	Number in Sample:	1	117	0	5	123
	% Males in Age Group:	1.0	95.2	0.0	3.8	100.0
	Estimated % of Escapement:	0.7	64.6	0.0	2.6	67.9
	Estimated Escapement:	69	6,765	0	272	7,105
	Standard Error:	68.5	366.0	0.0	121.0	
	Estimated Design Effects:	1.214	0.996	0.000	0.985	0.991
Female:	Number in Sample:	1	59	0	1	61
	% Females in Age Group:	2.1	96.3	0.0	1.6	100.0
	Estimated % of Escapement:	0.7	31.0	0.0	0.5	32.1
	Estimated Escapement:	69	3,241	0	55	3,365
	Standard Error:	68.5	352.2	0.0	54.0	
	Estimated Design Effects:	1.214	0.986	0.000	0.958	0.991
Total:	Number in Sample:	2	176	0	6	184
	Estimated % of Escapement:	1.3	95.6	0.0	3.1	100.0
	Estimated Escapement:	138	10,006	0	326	10,470 *
	Standard Error:	96.1	162.1	0.0	131.7	
	Estimated Design Effects:	1.202727	1.053	0.000	0.977	

* 4,210 fish that were counted through the weir during strata 1 - 7 & 9 are not included in this total.

APPENDIX 8.—Estimated length at age composition of weekly coho salmon escapements through the Tuluksak River weir, Alaska, 2004.

		Brood Year and Age Group			
		2001	2000	1999	
		1.1	2.1	2.2	3.1
Strata 1 - 7:	06/20 - 08/07				
No Samples Collected					
Stratum 8:	08/08 - 08/14				
Sampling Dates:	08/10				
Male:	Mean Length		541		540
	Std. Error		6		35
	Range		470- 595		505- 575
	Sample Size	0	38	0	2
	Mean Length		550		
Female:	Std. Error		7		
	Range		460- 615		
	Sample Size	0	23	0	0
Stratum 9:	08/15 - 08/21				
No Samples Collected					
Stratum 10:	08/22 - 08/28				
Sampling Dates:	08/23 & 08/24				
Male:	Mean Length		528		518
	Std. Error		9		28
	Range		400- 610		490- 545
	Sample Size	0	32	0	2
	Mean Length		532		570
Female:	Std. Error		7		
	Range		475- 580		
	Sample Size	0	22	0	1
Strata 11 & 12:	08/29 - 09/11				
Sampling Dates:	09/04 & 09/05				
Male:	Mean Length	530	558		600
	Std. Error		5		
	Range		465- 610		
	Sample Size	1	47	0	1
	Mean Length	515	563		
Female:	Std. Error		14		
	Range		485- 635		
	Sample Size	1	14	0	0
Strata 1 - 12:	06/20 - 09/11				
Sampling Dates:	08/10 - 09/05				
Male:	Mean Length	530	546		546
	Std. Error		4		22
	Range		400- 610		490- 600
	Sample Size	1	117	0	5
	Mean Length	515	547		570
Female:	Std. Error		5		
	Range		460- 635		
	Sample Size	1	59	0	1